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(54) Impact resistant panel

(57) A high velocity impact resistant panel consists of a Composite of multiply wood 1, stainless steel sheets 2 and polyamide-polyester woven textile 3, the layers being adhered together by epoxy type resins. The panel is lightweight enough to be of use in existing buildings but it is also capable of being used as the main construction material for small buildings like site offices and canteens.

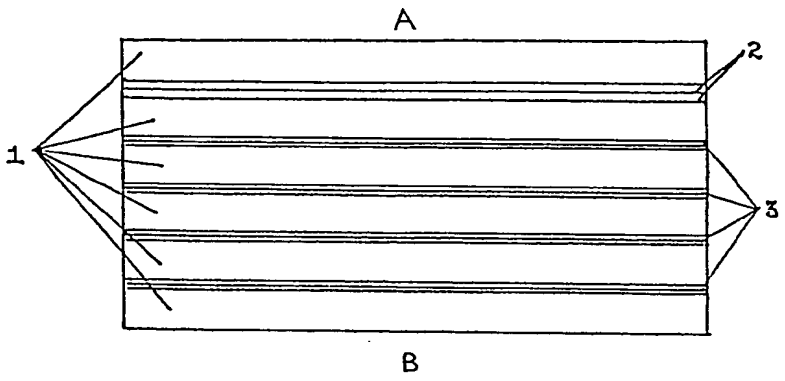

FIG. 1.

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The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

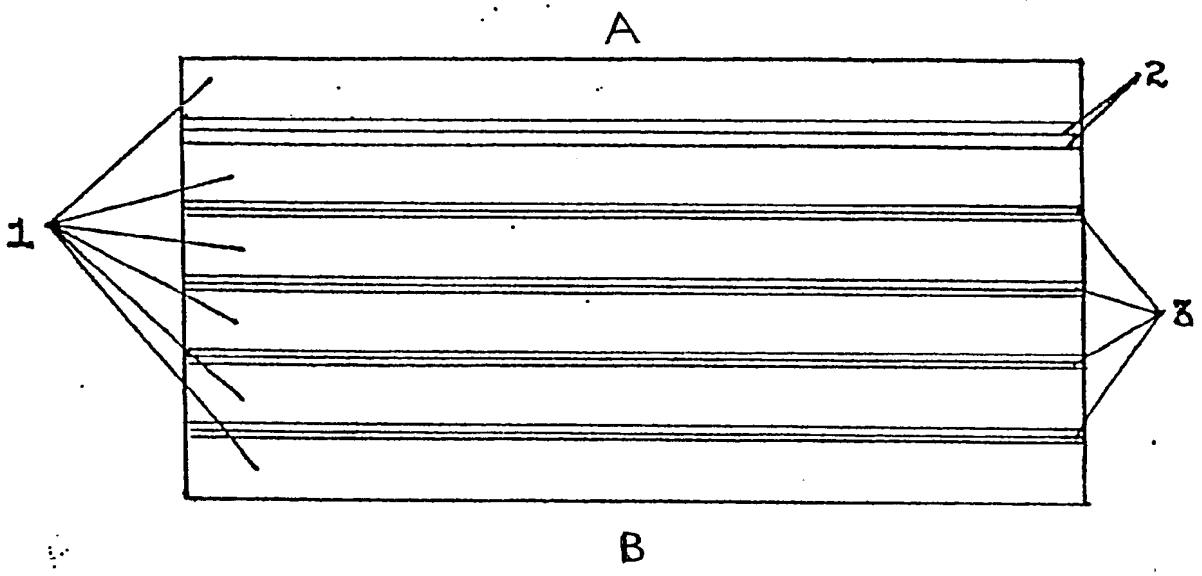

FIG. 1.

SPECIFICATION

High impact resistant panel

This invention relates to a high impact resistant panel which can be used either in new construction, or as a protective cladding in existing buildings, in order to guard the occupants from the dangers of shrapnel or spalled masonry when such buildings are the target of car bombs or ballistic mortars.

In urban situations, where home made weapons and explosives are being used, there exists a situation which is not amendable to standard treatment by the rules and mechanics which have been evolved in the study of armoury. In the first instance the metallurgy of the missile has not been designed and it is invariably shaped from commercial sheet, pipe and rod from mild steel and secondly the explosive charge is not organo-nitro in composition and is not shaped.

Bearing all these situations in mind there is required a high impact resistant panel which can be used to construct small area single storey buildings for use as site offices or canteens or to clad existing buildings so as to render them safe from attack by high speed shrapnel from car bombs or high energy impact from slow speed high weight ballistic mortars of the home made type.

In the case of cladding it is essential that the load put upon existing buildings be consistent with the age of the building and its load bearing capacity, invariably the requirement is that the load should be as light as possible. This factor produces the need for lightweight armoury and of course this parameter is normally inconsistent with the normal rules of ballistic attenuation which specify high weight reinforced concretes or high tensile steel plate of calculated thickness.

Use can be made of wood, fibre and steel, as composites, for panel construction in the urban war situation and according to the present invention there is provided a high impact resistent panel in the form of interlocking units, or cladding sections, which serve to hold high speed, lightweight shrapnel on one hand and to retain low speed ballistic mortars on the other without producing masonry spalling after the latter has exploded. Being constructed, in the main by volume, of low density components the panels are lightweight when compared with reinforced concrete or steel plate and their attachment to existing buildings, using the ground as foundation, does not in any way overload the structures. In cases of flat roofed buildings, or under the roof of slated structures, the panels are lightweight enough to be supported wall to wall and give the needed protection to this most vunerable aspect of the structure.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:-

Figure 1 is a cross section of the panel showing the order of the elements in the composite.

Referring to the drawing the high impact resistant panel comprises a composite made up of a number of three distinct elements, namely 22mm × 11 ply wood, 2.1mm panels of stainless steel and double layers of a polyamide/polyester fabric sold as Stabilenka 400 (TM) all bonded together with twin pack epoxy and other resins and shown in the drawing as 1, 2 and 3 respectively. The overall depth of thickness of the shown embodiment is about 160mm and the following materials were used in its build-up.

(a) Plywood, beech or other grain crossply high tensile timber as 11 ply.

(b) Stainless steel grade 304 bonded in pairs of plates with an epoxy resin of the type Ciba/Geigy 7064.

(c) Stabilanka fabric bonded in pairs of sheets with resin Ciba/Geigy 6414A or XB3117.

In practical use, under test firing conditions, it is found that the fibrous nature of the external grade plywood allows the missile to penetrate and destort its structure thus absorbing some energy and preventing the ricochetting of shrapnel. During the penetration of the wood the stainless steel plates begin to bulge inwards, or destort, and as this happens its resistence to deformation increases because it has been selected as a good work-hardening grade. As the penetration process continues the fabric now takes on an energy absorbing role because it has equal strength in both directions, because of the weave, and is placed in a position in the composite where the wood and steel have absorbed much of the initial impact energy. The stopping power depends on the energies involved and in practice it is found that the 160mm thickness of the panel is a good optimisation between stopping power and weight.

CLAIMS

1. A high velocity impact resistant panel comprising

a composite of laminates in the form of multiplywood, work hardening stainless steel sheets and layers of textile fabric formed as a rigid monolith by the overall use of a thermosetting adhesive or resin.

2. A high velocity impact resistant panel substantially as in Claim 1 wherein the work hardening stainless steel sheet is used in pairs of sheets which are bonded together, prior to panel construction, by the use of an epoxy type resin.

3. A high velocity impact resistant panel substantially as in Claim 1 wherein the textile fabric is bonded in pairs of sheets, at the time of panel construction, by the use of a less rigid epoxy resin than the type used in Claim 2.

4. A high velocity impact resistant panel substantially as in any of the above Claims in which the panel face A, as in the Figure, is the outward face of the panel which is used to clad a building or protect a roof.

5. A high velocity impact resistant panel substantially as in Claim 2 wherein the adhesive is an epoxy resin similar to the Ciba/Geigy Type 7064(TM).

6. A high velocity impact resistant panel substantially as in Claim 3 where the adhesive is an epoxy resin similar to the Ciba/Geigy Types 6414A or

XB3117(TM's).

7. A high velocity impact resistant panel substantially as in Claim 3 wherein the textile fibre is made from a polyamide + polyester blend which is woven in such a conformation that it has equal strength in both directions of the weft and warp and is embodied in a product known as Stabilenka 400 (TM).

8. A high velocity impact resistant panel substantially as in any of the above Claims and as illustrated in the Composite Section of the Figure.

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